

REMARKS

Claims 1-6, 29-35, 38-41, 43, and 44 are pending in the application. Claims 1-6, 29-35, 38-41, 43, and 44 stand rejected. Claims 1-6, 29-35, 38-41, and 43-44 are being amended. No new matter is believed to be introduced by way of the amendments.

Rejections Under 35 U.S.C. §102(b)

Claim 38 was rejected under 35 U.S.C. §102(b) as being anticipated by Paulraj *et al.* (U.S. Patent Number 5,345,599), hereinafter referenced as "Paulraj."

Claim 38, as amended in the Claim Listing above, recites:

A signal receiver for receiving communications signals, ~~said~~ the receiver comprising:

- an adaptive array ~~for receiving~~ configured to receive signals from remote units;
- a plurality of demodulator units ~~for processing said~~ configured to process the signals;
- a plurality of beamformers for constructing a desired signal response as a function of direction of arrival data of the signals; and
- a spatial diversity combiner for removing interference from ~~said~~ the signals.

In contrast to Applicants' Claim 38, Paulraj merely employs a combiner 98 that is "simply a d-way multiplexer" (see column 8, lines 11-49 and shown in Figs. 5 and 6 of Paulraj). The combiner 98 receives the demodulator/decoder signals 96, aligns the signals to compensate for differential delays experienced by the signals, and then combines the time aligned signals to obtain an estimated source stream. Although Paulraj employs the direction of arrival information to separate co-channel signals into individual signals prior to feeding them into his demodulators, nowhere in Paulraj is there mention of employing the direction of arrival information to construct or combine the signals input to his combiner 98.

Thus, Paulraj does not employ a combiner that constructs "a desired signal response as a function of direction of arrival data of the signals," as required by Applicants' amended Claim 38.

Therefore, it is Applicants' position that Claim 38 is allowable over Paulraj. Accordingly, Applicants respectfully request that the 35 U.S.C. § 102(b) rejection of this claim be withdrawn.

Claims 41 and 44 were rejected under 35 U.S.C. §102(b) as being anticipated by Ward *et al.* (U.S. Patent Number 6,104,930), hereinafter referenced as "Ward."

Claim 41, as amended in the Claim Listing above, recites:

A method for reducing signal interference, ~~said the~~ method comprising:
assigning at least one frequency bin to a user;
spacing ~~said the~~ at least one frequency bin belonging to ~~said the~~ user to at least one sufficiently different frequency as a function of minimizing signal strength of active bins to reduce inter-bin interference; and
locating ~~said the~~ at least one frequency bin with at least one frequency bin of other users such that directions of arrival for ~~said the~~ users are distinctly separable.

In contrast to Applicants' Claim 41, Ward merely employs a system where "each beam is substantially spatially fixed and the beams operate at carrier frequencies which are sufficiently separated from each other so as not to cause interference with each other, or with other beams radiating in adjacent cells." (see column 8, lines 6-10 and Fig.7 of Ward). Although Ward discusses separating beams based on their carrier frequencies to ensure that they do not interfere with each other, nowhere in Ward is there mention of spacing the frequency bins based on minimizing signal strength of active bins.

Thus, Ward does not employ a combiner that spaces "the at least one frequency bin belonging to the user to at least one sufficiently different frequency as a function of minimizing signal strength of active bins to reduce inter-bin interference," as required by Applicants' amended Claim 41.

Therefore, it is Applicants' position that Claim 41 is allowable over Ward. Accordingly, Applicants respectfully request that the 35 U.S.C. § 102(b) rejection of this claim be withdrawn.

Claim 44, as amended in the Claim Listing above, recites:

A method for avoiding interference in communications signals, ~~said the~~ method comprising:
partitioning available bandwidth into a plurality of frequency blocks, ~~said the~~ frequency blocks ~~comprising~~ including a plurality of bins;
assigning a user to a bin in each of ~~said the~~ frequency blocks; and
~~using signal power information to distribute said~~ distributing the bins within ~~said the~~ frequency blocks as a function of power of the bins.

Item 3 of the present Office Action refers to column 10, line 37 to column 11, line 42 of Ward and concludes that Ward employs the signal power as a distribution mechanism.

Applicants respectfully disagree with this view. Specifically, Ward merely maintains a pool of unassigned and allowable carrier frequencies. Depending on the number of incoming calls, individual carrier frequencies are allocated. Ward monitors underutilized carrier frequencies (i.e., carrier frequencies having a number of vacant communication channels) and reallocates these time slots to other carrier frequencies on the beam (see column 10, line 37 to column 11, line 42 of Ward). Nowhere in Ward is there mention of employing power information as a distribution mechanism. Ward merely employs traffic activity to allocate the available frequencies.

Thus, Ward does not teach or disclose “distributing the bins within the frequency blocks as a function of power of the bins,” as required by Applicants’ amended Claim 44.

Therefore, it is Applicants’ position that Claim 44 is allowable over Ward. Accordingly, Applicants respectfully request that the 35 U.S.C. § 102(b) rejection of this claim be withdrawn.

Rejections Under 35 U.S.C. §103(a)

Claims 1, 2, 4-6, 29-30, 32-34 were rejected under 35 U.S.C. §103(a) as being unpatentable over Alamouti *et al.* (U.S. Patent No. 5,933,421), hereinafter referenced as “Alamouti” in view of Paulraj, and further in view of Gardner *et al.* (U.S. Patent No. 5,260,968), hereinafter referenced as “Gardner.”

Claim 1, as amended in Claim Listing above, recites:

In a multi-point communications system having a receiver and transmitter disposed at a primary site for communication with a plurality of remote units disposed at respective secondary sites, an antenna comprising:

multiple receiving elements for receiving communications signals over a carrier frequency from said the plurality of remote units, at least two receiving elements configured to receive the communication signals on a same frequency band during any period of time, said the receiving elements being partitioned into a plurality of groups disposed ~~remote~~ remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity, each group containing at least one receiving element, at least one group including multiple receiving elements located ~~proximate~~ proximal to one another and no ~~further~~ farther apart than a predetermined maximum receiving element spacing to facilitate spatial filtering.

In contrast, Alamouti employs a system where a base station Z receives a first incoming signal, including a plurality of first Orthogonal Frequency Division Multiplexed (OFDM) frequency tones F2 in a first frequency band from a first remote station U during a first Time Division Multiple Access (TDMA) interval. The base station Z also receives a second incoming signal, including a plurality of second OFDM frequency tones F4 in the first frequency band from a second remote station W during a second TDMA interval. Thus, the first and second remote stations, U and W, receive the first and second sets of discrete frequency tones F2 and F4 during different periods of time (see Fig. 1 and Column 9, line 19-65 of Alamouti).

Thus, Alamouti does not teach or disclose “at least two receiving elements configured to receive the communication signals on a same frequency band at any period of time,” as required by Applicants’ amended Claim 1.

Paulraj and Gardner are being combined with Alamouti because Alamouti does not teach partitioning the receiving elements into a plurality of groups, where the plurality of groups disposed remotely from one another by at least a predetermined minimum group spacing sufficient to obtain spatial diversity, each group containing at least one receiving element, at least one group including multiple receiving elements located proximal to one another and no farther apart than a predetermined maximum receiving element spacing to facilitate spatial filtering. However, Paulraj and Gardner merely describe partitioning antenna elements into multiple groups and spacing them apart from each other at a predetermined spacing. Alamouti, as discussed above, does not teach having “at least two receiving elements configured to receive the communication signals on a same frequency band at any period of time.” The lack of these elements of Alamouti are not cured by Paulraj and Gardner.

A hypothetical system combining the teachings of Alamouti, Paulraj, and Gardner may be able to partition partitioning antenna elements into multiple groups and space them apart from each other at a predetermined spacing, but it would not have “at least two receiving elements configured to receive the communication signals on a same frequency band at any period of time,” nor would one of ordinary skill in the art would be motivated to modify the hypothetical system to receive the communication signals on a same frequency band at any period of time because this modification may cause the system of Alamouti to fail for its particular purpose,

since it would not be include two receiving elements to receive the communication signals on a same frequency band at any period of time.

Therefore, it is Applicants' position that Amended Claim 1 is allowable over Alamouti in view of Paulraj, and further in view of Gardner. Accordingly, Applicants respectfully request that the rejection of Claim 1 under 35 U.S.C. § 103(a) of this claim be withdrawn.

Claim 29 is being amended to include similar elements as Claim 1. Accordingly, Applicants respectfully submit that Amended Claim 29 overcomes the rejection under 35 U.S.C. §103(a) for the reasons presented above.

Because Claims 2 and 4-6 depend from now amended Claim 1 and claims 30 and 32-34 depend from amended Claim 29, Applicants respectfully submit that these claims should be allowed for at least the same reasons as the base claims from which they depend.

Claims 3 and 31 were rejected under 35 U.S.C. §103(a) as being unpatentable over Alamouti in view of Paulraj, in view of Gardner, and further in view of Chang *et al.* (Patent No. 5,414,433, hereinafter referred to as Chang).

Chang is being combined with Alamouti, Paulraj, and Gardner because these references do not teach a "predetermined minimum spacing no more than five times a wavelength." However, Chang does not teach or disclose having "at least two receiving elements configured to receive the communication signals on a same frequency band at any period of time," as required by Applicants' Claim 1.

A hypothetical system combining the teachings of Chang, Alamouti, Paulraj, and Gardner may be able to have a predetermined minimum spacing, but it will not have "at least two receiving elements configured to receive the communication signals on a same frequency band at any period of time," nor would one of ordinary skill in the art would be motivated to modify the hypothetical system to be configured to receive the communication signals on a same frequency band at any period of time because this modification would cause the system of Alamouti to fail since Alamouti's system does not include at least two receiving elements configured to receive the communication signals on a same frequency band at any period of time.

Accordingly, Applicants respectfully request that the 35 U.S.C. § 103(a) rejection of Claims 3 and 31 be withdrawn.

Claim 35 was rejected under 35 U.S.C. §103(a) as being unpatentable over Alamouti in view of Paulraj, in view of Gardner, and further in view of Reece *et al.* (Patent No. 5,771,024, hereinafter referred to as Reece).

Reece is being combined with Alamouti, Paulraj, and Gardner because these references do not teach “an array fixation structure configured to mount the plurality of adaptive antenna arrays thereon.” However, Reece does not teach or disclose having “at least two receiving elements configured to receive the communication signals on a same frequency band at any period of time,” as required by Applicants’ Claim 1.

A hypothetical system combining the teachings of Alamouti, Paulraj, Gardener, and Reece may have an array fixation structure for mounting the plurality of adaptive antenna arrays, but it will not have “at least two receiving elements configured to receive the communication signals on a same frequency band at any period of time,” nor would one of ordinary skill in the art be motivated to modify the hypothetical system to do so because this modification may cause the system of Alamouti to fail since Alamouti’s system does not include at least two receiving elements configured to receive the communication signals on a same frequency band at any period of time.

Accordingly, Applicants respectfully request that the 35 U.S.C. § 103(a) rejection of 35 be withdrawn.

Claim 39 was rejected under 35 U.S.C. §103(a) as being unpatentable over Paulraj in view of Forssen *et al.* (Patent No. 5,566,209, hereinafter referred to as “Forssen”).

Forssen is being combined with Paulraj because Paulraj does not teach a “direction of arrival processor configured to calculate the direction of arrival.” However, Forssen does not teach or disclose having “a plurality of beamformers configured to construct a desired signal response as a function of direction of arrival data of the signals,” as required by Applicants’ amended Claim 38.

A hypothetical system combining the teachings of Paulraj and Forssen may have a direction of arrival processor but it will not have “a plurality of beamformers configured to construct a desired signal response as a function of direction of arrival data of the signals.”

Accordingly, Applicants respectfully request that the 35 U.S.C. § 103(a) rejection of Claim 39 be withdrawn.

Claim 40 was rejected under 35 U.S.C. §103(a) as being unpatentable over Paulraj in view of Alamouti.

Alamouti is being combined with Paulraj because Paulraj does not teach employing OFDM. However, Alamouti does not teach or disclose having “a plurality of beamformers configured to construct a desired signal response as a function of direction of arrival data of the signals,” as required by Applicants’ Amended Claim 38, from which Claim 40 depends.

A hypothetical system combining the teachings of Paulraj and Alamouti may employ OFDM, but it will not have “a plurality of beamformers configured to construct a desired signal response as a function of direction of arrival data of the signals.”

Accordingly, Applicants respectfully request that the 35 U.S.C. § 103(a) rejection of Claim 40 be withdrawn.

Claim 43 was rejected under 35 U.S.C. §103(a) as being unpatentable over Ward. However, as discussed above, Ward does not employ a combiner that spaces “the at least one frequency bin belonging to the user to at least one sufficiently different frequency as a function of minimizing signal strength of active bins to reduce inter-bin interference,” as required by Applicants’ amended Claim 43.

Accordingly, Applicants respectfully request that the rejection of Claim 43 under 35 U.S.C. § 103(a) be withdrawn.

Double Patenting Rejection

Claims 38-39, 41, and 43 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2 and 4 of U.S. Patent No. 6,795,424. A Terminal Disclaimer is being filed concurrently with this Reply. Accordingly, the double patenting rejection of Claims 38-39, 41, and 43 is believed to be overcome.

CONCLUSION

In view of the above amendments and remarks, it is believed that all currently pending claims, claims 1-6, 29-35, 38-41, 43, and 44 are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.

By Mark B Solomon
Mark B/ Solomon
Registration No. 44,348
Telephone: (978) 341-0036
Facsimile: (978) 341-0136

Concord, MA 01742-9133

Date: 12/15/08